

Flight Demonstration of a Micropump-based Stage Pressurization System, Phase I

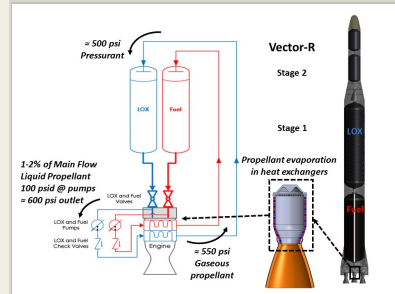
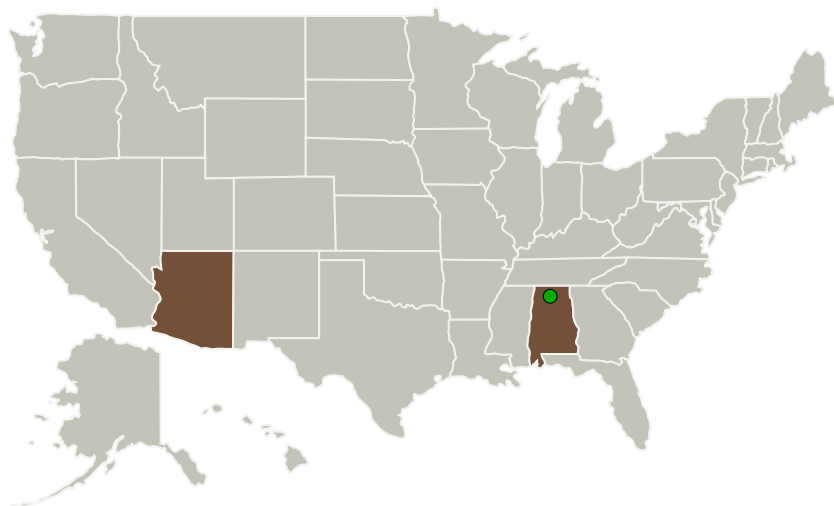
Completed Technology Project (2017 - 2017)



Project Introduction

Vector Launch, Inc. proposes to apply recent advances in micropump and additive manufacturing technologies to develop and demonstrate a micropump-based autogenous pressurization system for its commercial Vector-R first stage and mature the technology with multiple static-fire-tests leading to a demonstration flight test (TRL 6). The Vector-R is a 2-stage pressure-fed, LOX/subcooled propylene commercial small launch vehicle, designed to place up to 60 kg in low earth orbit. In the proposed concept, electrically-driven micropumps drive a small portion of each propellant over a heat exchanger at the engine to pressurize the tanks. Excess flow can be diverted to the engine as needed. This approach reduces system mass, complexity and acquisition cost as well as operational costs. It eliminates the need for all high-pressure tanks and associated components. It can be used on any pressure-fed stage, for launch vehicle and in-space application when using high vapor pressure propellants such as LOX/methane or LOX/propane. As such, it is an enabler for missions targeted to use in-situ propellants since the need for a separate pressurant like helium is either greatly reduced or eliminated. By leveraging Vector's ongoing Vector-R micro-launcher development, it is possible to reach TRL 6 with demonstration flight testing during Phase II.

Primary U.S. Work Locations and Key Partners



Flight Demonstration of a Micropump-based Stage Pressurization System, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Vector Launch Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Tucson, Arizona
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Vector Launch Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

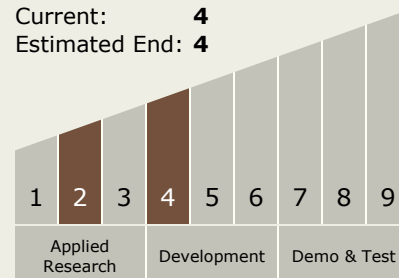
Carlos Torrez

Principal Investigator:

Christopher Bostwick

Technology Maturity (TRL)

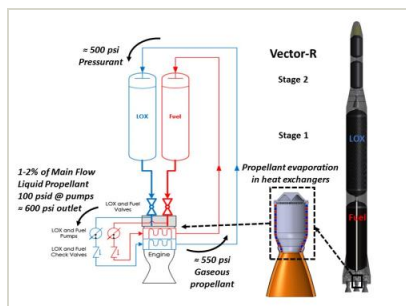
Start: 2
Current: 4
Estimated End: 4



Primary U.S. Work Locations

Alabama	Arizona
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Images



Briefing Chart Image

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Briefing Chart Image

(<https://techport.nasa.gov/image/129108>)

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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.1 Integrated Systems and Ancillary Technologies